

## **BACTERIAL URINARY TRACT INFECTIONS(UTIS) ASSOCIATED WITH DIABETS**

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(Received 11 March 2008 ,Accepted 13 August 2008)

**Keywords:** UTI, *E .coli*, infection, diabetes.

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### **ABSTRACT**

One hundred (urine & blood ) samples were collected from Al-Fayhaa hospital patients with UTI from July 2006 to July 2007. Eighty one patients were suffered from diabetic, the levels of blood sugar were ( 100 - 350 mg / dl. ) for fasting patients and( 200- 500 mg / dL. ) for random test . Nineteen patients were not diabetic. General Urine Examination ( GUE ) and urine culture were done for samples, eighty-three samples were positive to bacterial culture. The bacteria were identified by biochemical tests ( catalase, oxidase, IMVIC tests, H<sub>2</sub>S production, urease, coagulase und growth in 6.5 % NaCl) after Gram stain and motility test. The results showed that (37) isolates were *E. coli*, (20) *Staphylococcus aureus*, (16 ) for *Klebsiella pneumonia*, (7)for *Proteus Sp.*, (5) *Staphylococcus epidermidis*, (5)*Pseudomonas aureoginosa* and *Enterococcus faecalis* (3). GUE showed that 94 patients have pus cells , crystal, uric acid and amorphous crystal that provide UTI. In conclusion the study showed that the patients with a history of chronic diabetes (2-25)years developed UTI.

### **INTRODUCTION**

A urinary tract infection (UTI ) is a condition where one or more structures in the urinary tract (from the kidneys passing through ureters, bladder then to the urethra became infected after bacteria overcome its strong natural defenses ( 1, 2 ) Almost 95 % of UTIS cases are caused by bacteria that typically multiply at the opening of the urethra and traveled up to the bladder ( ascending route ). less often, bacteria spread to the kidney from the blood stream ( descending route).

UTI caused by a variety of bacteria that ascend into the urinary tract and establish bacteriuria often at levels more than or equal to  $10^5$  colony forming units of bacteria / ml of urine (1, 3, 4, 5). Physicians classified UTIS in different manner to help them choose treatments and determine the causes of infections, it's classified as Primary and recurrent, depending on whether they are the first infection or repeated events . They are also defined as either being uncomplicated or complicated infection depending on factors that trigger the infection uncomplicated infections are only associated with bacterial infection, most often *Escherichia coli* (6). Complicated infections, caused by bacteria also but they occur as a result of some anatomical or structural abnormality such as catheter use in hospital setting. bladder or kidney dysfunction, kidney transplant, or association with diabetes mellitus or sickle cell disease or trait. (7, 8)

Patient with diabetes have an increased risk of UTIS many studies showed that most patient with diabetes had this infections (9, 10). Many UTIs are a symptomatic, and whether symptomatic UTIS are preceded by a symptomatic bacteriuria ( ASB ) which is defined as  $> 10$  CFU per milliliter of urine is not known (11, 12). Higher prevalence of ASB has been found in women with diabetes than in women without the disease (13). Some investigators, have been unable to confirm this finding ( 2 ) , because more UTI complication ( e.g. bacterimia, renal abscess, renal papillary, necrosis ) were seen in patients with diabetes ( 14 ).

diabetes are defined as a fasting glucose concentration of  $\geq 7.8$  mmol /l, a 2-h glucose concentration of  $\geq 11.1$  mmol /l or the use of glucose - lowering medication ( oral agent or insulin ) (15). The symptoms and signs of cystitis in diabetic patient are the same as for non-diabetic patients, however, because of the high incidence of un suspected upper UTI in diabetic person, bilateral pyelonephritis is twice common in patients with diabetes ( 16 ).So the aim of the study is to identify the bacteria that cause UTI in patients with diabetes.

## **MATERIAL& METHODS**

**Sample collection:** The collection was performed according to (17).Samples were collected from July 2006 to July 2007 from the patients with diabetes , both sexes and in different ages ,

**Urine samples:** Urine collected after asking the patients if they take any antibiotics, it was collected from adult patients after recommended them to cleaned the vulva and labia in women and testes in men after washing hand by soap , then pass small amount of urine ( mid-stream ) left first drops, in the sterile container and close it directly.

**Blood samples :** about 2 ml of blood taken from patients to examined blood sugar levels.

**Urine examination:** Examination of color, turbidity, acidity. microscopic examination, determination of sugar and albumin content in urine were done, this Samples were divided into three parts one to ordinary microscopic examination ( pus , crystal , pH, parasite, epithelial cell, .. ect. ) Smears of uncenterifuged urine stained by gram stain and thin examined microscopically. Color and turbidity were observed optically whereas acidity was determined by using pH disk divided 1-4 different color, urine put on it and the result color comprised with stander color to determined acidity another parts to cultured it immediately on the routine culture media, if necessary it stored at 4 'c to avoid contamination, the last part was to made the chemical examinations ( sugar, albumin ), sugar content was determined by Benedict's reagent, by added 5 ml of reagent to 0.5 ml of urine and heated it at 2 min, with shaking , the positive result recorded if reddish yellow to green color were observed. The albumin content was determined by added 2 drops of sulphosalsalic acid to 5 ml of urine, positive result recorded if urine become turbid.

**Urine culture :** The samples were cultivated according to (16 ) on MacConkey, Blood, Chocolate, Mannitol salt agar and then incubated aerobically in 37 C° for 24-48 hours . Before characterization the isolates were recultured and pured on Nutrient agar.

**Bacterial characterizations:** All biochemical tests were established according to ( 1 ) Pure cultures were used to made biochemical tests, according to gram stain and grow on culture media there were two kinds of isolates (Gram positive and negative ). Gram negative isolates were tested by Oxidase test to distinguished Pseudomonidaceae from Enterobacteriaceae. Oxidase negative isolates were tested by Urease to distinguished the genus *Proteus* from Enterobacteriaceae member.

The last gram negative isolates were tested by IMVIC test ( Indol - Methyl red\_ Vogas proskauer \_Citrate ) to distinguished *E. coli* from *Klebsiella* and *Enterobacter* , and H<sub>2</sub>S production test was done to distinguished *E. coli* from Salmonella, Shigella and Proteus according to sugar fermentation. and the motility of bacteria was tested to distinguished between *Klebsiella* and *Enterobacter*, Gram positive isolates were tested by Catalase to distinguished between *Staphylococci* and *Streptococci* and Coagulase to distinguished between *S. aureus* and *S. epidermides*, Blood hemolysis were another evidence confirm the characterization of *Streptococcus* species.

## **RESULTS**

From 100 samples, 93 isolates were identified, 81 diabetic patients have UTI, 70 of them had a high level of blood sugar and urine sugar and 11 patients were with low levels of blood sugar. from the history of patients, 62 of them were chronic diabetes and 19 patients were have diabetes from less than two years, after two years they infected with UTI. The level of blood sugar were from 100 - 350 for fasting patient and 200-500 for random blood sugar.

### **Laboratory Diagnosis :**

**General Urine examination (GUE ):** Ninety four of samples were positive to GUI they content pus (5- 15 cells ) that provide UTI, needle salt crystals, uric acid crystals, amorphous crystals, only six samples were clear. Most samples were acidic so the pH paper became red when put in it, white in color, turbid, chemical examination showed that urine sugar were often from one cross + to four cross +++, furthermore most samples were contained albumin so they lock turbid when drops of sulphosalic acid were added to it.

Blood sugar: The present study showed that there were fifty female twenty males safer from high level of blood sugar from 100 - 350 for fasting patient and 200- 500 for random blood sugar. ten females and one male were had low levels of blood sugar less than the ranges mentioned.

**Urine culture:** All samples were cultured on ordinary media but only ninety three isolates were obtained there was single sample have more than one kind of bacteria. seventeen samples were negative to culture, although its GUI showed pus and crystals. The present study showed that 72 of urine samples from the 83 samples were positive to female patients ,11 samples were positive to male only 6 female urine samples were negative whereas eleven male samples were negative ( table 1).

Table (1)the result of urine culture>

Gender \ Result of culture	male	female
72 Positive culture ( 83	11	72
Negative culture ( 17)	11	6

Forty eight females and nine males that had high level of blood sugar were positive to culture, whereas eight females eleven males were negative in urine culture, for females had low blood sugar , two were positive and two negative to culture and one male had low level of blood sugar , and were positive to urine culture. ( table 3 ).

Table (2) results of urine culture due to blood sugar levels

Blood sugar levels \ Culture results	High blood sugar levels		Low blood sugar levels	
	male	female	male	female
Positive culture (66)	9	48	1	8
Negative culture (15)	11	2	0	2

The present study showed the relation between the periods of diabetic in patients and UTI , forty seven females seven males which gotten diabetes for two years or more show positive results in urine culture, only three females , five males showed negative results in culture although they safer from diabetes for two years or

more, whereas the patients that had diabetes for less than two years showed twelve positive cultures ( nine females three males ), nine negative cultures ( three females, six males). (table 3)

Table (3 ) the effect of diabetes periods and UTI

periods of diabetes Culture results	Two years or more		Less than two years	
	male	female	male	female
Positive culture (66)	7	47	3	9
Negative culture (15)	5	3	6	1

Bacterial characterization : The results bacterial characterization showed that thirty seven isolates characterized us *E. coli* , twenty were *Staphylococcus aureus* sixteen were *Klebsiella pneumonia* , seven *Proteus Sp.*, five *Staphylococcus epidermidis*, five *pseudomonas aureoginosa* and three were *Enterococcus faecalis*.( table 4)

Table (4) bacterial isolates and its biochemical test isolates

isolates	No. of isolates	Gram stain	IMVIC TESTES				CATALASE	OXIDASE	COAGULASE	URASE	GROWTH IN 6.5% NaCl	H2S PRODUCTION stant	butt	H2S
			I	M	V	C								
<i>Staphylococcus epidermidis</i>	5	+			+		+	-	-	+	+			
<i>Staphylococcus aureus</i>	20	+			+		+	-	+	+	+			
<i>Enterococcus faecalis</i>	3	+			-		+	-	-	-	+			
<i>E. coli</i>	37	-	+	+	-	-	+	-		-	-	A	A	-
<i>Klebsiella SP.</i>	16	-	-	-	+	+	+	-		+	-	A	K	-
<i>pseudomonas aureoginosa</i>	5	-	-	-	-	-	+	+		+	-			
<i>Proteus Sp.</i>	7	-	+	-	-	-	+	+		+	-	A	K	+

I= Indol, M=Methyl red, V=Voges proskaur, C=Citrate, A= acid reaction, K= alkaline reaction, - = Negative reaction, + = positive reaction.

## DISCUSSION

Urinary tract infections results from the ascension of focally derived organisms and periurethral tissues into the bladder and kidneys. and this facilitated by behavioral factors.( 3 ). Anyone can get UTI , but they are more common in women. This is because the urethra in females is shorter and closer to the anus, where *E coli* bacteria are common (5, 18 ) and this agreement with the present study which showed that 72 samples of 83 positive. culture where to female and 11 for male, 6 females, 11 male were not infected.

Diabetes patients are particularly prone to urinary tract infection because hyperglycemia causes sugar to spill into the urine, and that sugary urine, while still in the body, It becomes friendly to bacterial cultures since another symptoms, hyperglycemia is excess urination, all tissues of urinary tract are being frequently bathed with sugary bacterial culture(12). All diabetic patients that have high level of blood sugar ( Random or fasting) and they periods of infection more than two years getting UTI . this results were agreement with( 1, 9,19, 20, 21).

In the present study 48 female patients safer from high level of blood sugar were positive to urine culture, 8 females were have high level of blood sugar but negative to urine culture this may cause by the false information that getting from patients as taking antibiotics or the patients may safer from diabetes from short time or perhaps they had fungal or parasite UTI , whereas 9 male with high level value of blood sugar were positive and 11 negative to urine culture this may be due to the same causes like negative culture of females . female which were low level blood sugar 2 positive 2 negative to urine culture, whereas male were 1 positive and no negative results for urine culture. 14 females which had diabetes for two years or more were positive to urine culture, 8 females were negative only , this results documented that the time is very important agents for UTI in diabetic patients. 7 male were positive, 5 negative for culture, whereas 9 females positive 3 negative to culture when they get disease for less than two years, 2 males positive, 6 negative to the culture to the same periods.

The present study which showed that most isolates of urine culture were. *E.coli* was observed in the samples this agreement with many papers and researches which recorded that *E. coli* is the most causative agent of UTI in all types ( cystitis, pyelonephritis, urethritis) (8, 21, 22). Another isolates that reported in the present study also reported and in the same arrangement of occurrence in ( 3, 5, 8,23,24).

**Acknowledement** :I wish to express my thanks to PhD. Awatif Al- Mohasin for her help. Also I express my thanks to Dr. Bashar Kasem for his help in samples collection and his well advices. Grateful acknowledgments are made to the head and workers in the laboratories of AL - Fayhaa hospital and I castrate Dr. Basam, Mr. Sabah, Mr. Kadem, Mr. Mardan & Mr. Moataz. Mss. Soad, Mss. Fatema , Mss. Nedaa Also I would to thank Mr. Hammed wahed to his aids in samples collection.

### **التهاب المجاري البولية الجرثومية المقترنة بالسكري**

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### **الخلاصة**

جمعت مائة عينة (دم وادرار) من مرضى التهابات المجاري البولية الذين راجعوا مستشفى الفحاء العام في محافظة البصرة من شهر تموز ٢٠٠٦ الى شهر تموز ٢٠٠٧. احدى وثمانون مريضاً كانوا يعانون من السكري اذ تراوحت مستويات السكر لديهم ( 100 - 350 mg / dl. ) في حالة الصيام و ( 200- 500 mg / dL. ) في المرضى المتناولين للطعام. بينما كان ١٩ مريضاً غير مصابين بالسكري استخدموا كسيطرة. فحصت العينات باستخدام اختباري الفحص العام والزرع الجرثومي للادرار، اذ لوحظ ان ٨٣ عينة كانت موجبة للزرع الجرثومي وشخصت الجراثيم باستخدام الاختبارات الكيموحيوية بعد تصبغ الجراثيم بصبغة كرام وفحص الحركة. اظهرت النتائج ان ٣٧ عينة تعود لجرثومة *E. COLI* و ١٦ ل *Staphylococcus aureus* و ١٦ ل *Klebsiella pneumonia* و ٧ ل *Proteus* و ٥ ل *Staphylococcus epidermidis* و ٥ ل *Pseudomonas aureoginosa* و ٣ ل *Enterococcus faecalis*. اظهرت ٩٤ عينة فحصت بفحص الادرار العام خلايا قحيية و بلورات ملحية وبلورات حامض اليوريك مما يثبت وجود التهابات في المجاري البولية. تم الاستنتاج ان المرضى الذين يعانون من السكري لمدة تزيد عن سنتين يصابون بالتهابات في المجاري البولية.



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